

ภาคผนวกที่ 5

เอกสารการสอบเทียบเครื่องมือ

- | | | |
|--------|-----|---|
| เอกสาร | 5-1 | เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ |
| เอกสาร | 5-2 | เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากปล่อง |
| เอกสาร | 5-3 | เอกสารสอบเทียบเครื่องมือการตรวจคุณภาพอากาศในสถานประกอบการ
(Working Area) |
| เอกสาร | 5-4 | เอกสารสอบเทียบเครื่องมือการตรวจระดับเสียงโดยทั่วไปและเสียงในสถานประกอบการ
(Working Area) |
| เอกสาร | 5-5 | เอกสารสอบเทียบเครื่องมือการตรวจค่าความร้อนในสถานประกอบการ
(Working Area) |

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
1. คุณภาพอากาศในบรรยากาศ <ul style="list-style-type: none"> TSP 	<ul style="list-style-type: none"> High Volume Air Sampler No. B33, B43, B44 	<ul style="list-style-type: none"> Digital Balance
<ul style="list-style-type: none"> PM₁₀ 	<ul style="list-style-type: none"> High Volume PM-10 Air Sampler No. B06, B34, R13 	<ul style="list-style-type: none"> Digital Balance
<ul style="list-style-type: none"> SO₂ 	<ul style="list-style-type: none"> Gas Sampler Box No. B08, B09, B10 	<ul style="list-style-type: none"> Spectrophotometer
<ul style="list-style-type: none"> NO₂ 	<ul style="list-style-type: none"> NO₂ Analyzer No. R02, R05, R07 	<ul style="list-style-type: none"> NO₂ Analyzer No. R02, R05, R07
2. ระดับเสียงโดยทั่วไป <ul style="list-style-type: none"> L_{eq} 1 hr L_{eq} 24 hr L_{max} L₉₀ 	<ul style="list-style-type: none"> Acoustic Calibrator Sound Level Meter No. B17, B24, B27, B29, R35, R45, R54 	-
3. คุณภาพอากาศจากปล่องระบาย <ul style="list-style-type: none"> TSP 	<ul style="list-style-type: none"> Console No. B05 Pitot Tube No. B49 	<ul style="list-style-type: none"> Digital Balance
<ul style="list-style-type: none"> SO₂ 	<ul style="list-style-type: none"> Personal Pump SKC No. B21 Rotameter No. H-B07 	-
<ul style="list-style-type: none"> NO_x 	<ul style="list-style-type: none"> Vacuum Gauge 	<ul style="list-style-type: none"> Spectrophotometer
<ul style="list-style-type: none"> CO 	<ul style="list-style-type: none"> Gas Bag 	<ul style="list-style-type: none"> Non-Dispersive Infrared Detection Method
4. คุณภาพอากาศในสถานประกอบการ <ul style="list-style-type: none"> Total Dust 	<ul style="list-style-type: none"> Personal Pump SKC No. B32, B44, B51, B64, B73, B92 Rotameter No. H-B03, H-B07 	<ul style="list-style-type: none"> Digital Balance
5. ระดับเสียงในสถานประกอบการ <ul style="list-style-type: none"> L_{eq} 8 hr 	<ul style="list-style-type: none"> Acoustic Calibrator Sound Level Meter No. ACO-B36, B41, B43, R40, R41, R50 	-
6. ความร้อนในสถานประกอบการ <ul style="list-style-type: none"> WBGT 	<ul style="list-style-type: none"> Digital Thermometer with Probe No. B05, B07, B11, B32, B33, R04 	-

เอกสารที่ 5-1

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-1370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	05/02/2025	$y = 1.190x - 4.759$	0.999
B02	B02	05/02/2025	$y = 1.167x - 1.802$	0.999
B03	B03	03/02/2025	$y = 1.142x - 3.352$	0.997
B04	B04	06/02/2025	$y = 1.160x - 3.139$	0.998
B05	B05	06/02/2025	$y = 1.155x - 5.601$	0.996
B06	B06	06/02/2025	$y = 1.150x - 1.476$	0.999
B07	B07	03/02/2025	$y = 1.143x - 3.035$	0.998
B08	B08	03/02/2025	$y = 1.161x - 4.459$	0.999
B09	B09	05/02/2025	$y = 1.177x - 3.970$	0.996
B10	B10	03/02/2025	$y = 1.144x - 2.471$	0.998
B11	B11	03/02/2025	$y = 1.195x - 5.384$	0.996
B12	B12	04/02/2025	$y = 1.168x - 4.228$	0.998
B13	B13	04/02/2025	$y = 1.165x - 3.801$	0.999
B14	B14	04/02/2025	$y = 1.148x - 3.248$	0.996
B15	B15	04/02/2025	$y = 1.173x - 4.773$	0.997
B16	B16	04/02/2025	$y = 1.156x - 4.042$	0.998
B17	B17	06/02/2025	$y = 1.140x - 2.730$	0.999
B18	B18	06/02/2025	$y = 1.171x - 4.178$	0.999
B19	B19	06/02/2025	$y = 1.151x - 3.979$	0.999
B20	B20	04/02/2025	$y = 1.129x - 1.255$	0.999
B21	B21	04/02/2025	$y = 1.132x - 3.156$	0.999
B22	B22	04/02/2025	$y = 1.147x - 2.649$	0.997
B23	B23	03/02/2025	$y = 1.158x - 3.223$	0.999
B24	B24	05/02/2025	$y = 1.144x - 3.476$	0.997
B25	B25	03/02/2025	$Y = 1.071x + 1.478$	0.997
B26	B26	04/02/2025	$y = 1.142x - 4.263$	0.999
B27	B27	04/02/2025	$y = 1.175x - 5.192$	0.996
B28	B28	04/02/2025	$y = 1.173x - 5.127$	0.999
B29	B29	04/02/2025	$y = 1.145x - 1.952$	0.996
B30	B30	06/02/2025	$y = 1.162x - 3.062$	0.999
B31	B31	03/02/2025	$y = 1.182x - 5.652$	0.998
B32	B32	03/02/2025	$y = 1.167x - 3.993$	0.999
B33	B33	05/02/2025	$y = 1.168x - 4.451$	0.998
B34	B34	05/02/2025	$y = 1.127x - 3.203$	0.999



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B35	B35	05/02/2025	$y = 1.163x - 3.579$	0.997
B36	B36	05/02/2025	$y = 1.130x - 2.116$	0.999
B37	B37	04/02/2025	$y = 1.146x - 2.265$	0.996
B38	B38	04/02/2025	$y = 1.156x - 6.034$	0.998
B39	B39	03/02/2025	$y = 1.151x - 3.366$	0.998
B40	B40	03/02/2025	$y = 1.174x - 4.582$	0.999
B41	B41	06/02/2025	$y = 1.123x - 1.633$	0.997
B42	B42	03/02/2025	$y = 1.149x - 3.382$	0.997
B43	B43	03/02/2025	$y = 1.137x - 2.074$	0.997
B44	B44	03/02/2025	$y = 1.155x - 1.460$	0.999
R01	R01	04/02/2025	$y = 1.121x - 3.007$	0.999
R02	R02	03/02/2025	$y = 1.159x - 5.099$	0.999
R03	R03	05/02/2025	$y = 1.138x - 2.774$	0.998
R04	R04	05/02/2025	$y = 1.118x - 2.575$	0.999
R05	R05	03/02/2025	$y = 1.136x - 1.720$	0.998
R06	R06	05/02/2025	$y = 1.154x - 2.706$	0.997
R07	R07	03/02/2025	$y = 1.037x + 1.361$	0.999
R08	R08	03/02/2025	$y = 1.146x - 3.762$	0.996
R09	R09	05/02/2025	$y = 1.121x - 2.360$	0.997
R10	R10	05/02/2025	$y = 1.180x - 4.626$	0.999
R11	R11	05/02/2025	$y = 1.147x - 3.861$	0.996
R12	R12	03/02/2025	$y = 1.128x - 4.676$	0.998
R13	R13	04/02/2025	$y = 1.135x - 4.055$	0.999
R14	R14	04/02/2025	$y = 1.153x - 3.122$	0.997
R15	R15	03/02/2025	$y = 1.161x - 5.223$	0.998
R16	R16	03/02/2025	$y = 1.187x - 6.674$	0.999
R17	R17	03/02/2025	$y = 1.120x - 1.730$	0.999
R18	R18	03/02/2025	$y = 1.146x - 2.347$	0.998
R19	R19	06/02/2025	$y = 1.161x - 5.195$	0.999
R20	R20	06/02/2025	$y = 1.134x - 3.449$	0.998



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	04/02/2025	y = 1.135x-1.122	0.996
B02	B02	04/02/2025	y = 1.140x-0.728	0.999
B03	B03	04/02/2025	y = 1.160x-3.702	0.998
B04	B04	05/02/2025	y = 1.154x-4.671	0.999
B05	B05	06/02/2025	y = 1.151x-2.705	0.998
B06	B06	03/02/2025	y = 1.114x-1.672	0.997
B07	B07	03/02/2025	y = 1.085x+0.543	0.996
B08	B08	04/02/2025	y = 1.149x-2.014	0.998
B09	B09	03/02/2025	y = 1.081x+0.344	0.997
B10	B10	03/02/2025	y = 1.094x-1.679	0.997
B11	B11	05/02/2025	y = 1.137x-0.690	0.997
B12	B12	03/02/2025	y = 1.094x-1.679	0.997
B13	B13	03/02/2025	y = 1.172x-3.186	0.998
B14	B14	05/02/2025	y = 1.160x-5.111	0.998
B15	B15	03/02/2025	y = 1.141x-2.637	0.998
B16	B16	04/02/2025	y = 1.106x+1.699	0.998
B17	B17	04/02/2025	y = 1.105x+1.676	0.998
B18	B18	04/02/2025	y = 1.176x-3.948	0.997
B19	B19	04/02/2025	y = 1.065x+0.997	0.998
B20	B20	04/02/2025	y = 1.163x-5.103	0.997
B21	B21	05/02/2025	y = 1.120x+0.250	0.999
B22	B22	06/02/2025	y = 1.152x-3.458	0.998
B23	B23	06/02/2025	y = 1.149x-3.696	0.999
B24	B24	03/02/2025	y = 1.109x-1.930	0.999
B25	B25	03/02/2025	y = 1.166x-4.876	0.998
B26	B26	05/02/2025	y = 1.118x-2.223	0.997
B27	B27	03/02/2025	y = 1.127x-3.668	0.999
B28	B28	04/02/2025	y = 1.112x-2.294	0.999
B29	B29	04/02/2025	y = 1.155x-4.309	0.997
B30	B30	04/02/2025	y = 1.136x-2.651	0.998
B31	B31	03/02/2025	y = 1.086x+2.828	0.999
B32	B32	04/02/2025	y = 1.099x-0.279	0.998
B33	B33	04/02/2025	y = 1.152x-4.474	0.997
B34	B34	04/02/2025	y = 1.149x-0.892	0.997



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com, www.spscon.com

High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
R01	R01	04/02/2025	y = 1.168x-5.536	0.996
R02	R02	04/02/2025	y = 1.116x-2.200	0.998
R03	R03	03/02/2025	y = 1.160x-5.911	0.997
R04	R04	03/02/2025	y = 1.129x-4.829	0.999
R05	R05	03/02/2025	y = 1.119x-3.825	0.998
R06	R06	05/02/2025	y = 1.125x-1.580	0.997
R07	R07	06/02/2025	y = 1.152x-2.503	0.997
R08	R08	03/02/2025	y = 1.114x-1.275	0.996
R09	R09	03/02/2025	y = 1.130x-4.187	0.999
R10	R10	05/02/2025	y = 1.151x-2.832	0.998
R11	R11	05/02/2025	y = 1.134x-2.692	0.997
R12	R12	05/02/2025	y = 1.158x-4.761	0.996
R13	R13	03/02/2025	y = 1.137x-3.435	0.999
R14	R14	03/02/2025	y = 1.126x-2.499	0.996
R15	R15	04/02/2025	y = 1.111x-3.285	0.999
R16	R16	04/02/2025	y = 1.124x-0.808	0.996
R17	R17	04/02/2025	y = 1.141x-3.412	0.999
R18	R18	03/02/2025	y = 1.115x-3.615	0.998
R19	R19	03/02/2025	y = 1.117x-0.234	0.996
R20	R20	06/02/2025	y = 1.146x-4.675	0.997



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72. Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	20 February 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R02	SERIAL NO.	2285		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00726SV		
Certified Date : 05 January 2023		Expired Date : 05 January 2026		Cylinder Conc. : 48.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.004
NO _x Span	400	399.8	-0.050	400.0	1.008
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	508	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.3	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCELL PRESS	8.5	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO _x Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO _x Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chaluchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	20 February 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R05			SERIAL NO.	4413
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00726SV		
Certified Date : 05 January 2023		Expired Date : 05 January 2026		Cylinder Conc. : 48.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	399.7	-0.075	400.0	1.006
NO _x Span	400	400.2	0.050	400.0	1.009
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	504	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.1	mV	-20 - 150		
AZERO	93.8	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.006	-	1.0 ± 0.3		
NO _x Slope	1.009	-	1.0 ± 0.3		
NO Offset	1.3	mV	-20 to +150		
NO _x Offset	0.9	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72 Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 20 February 2025

BRAND : API

MODEL : 200E

NO. NOX-R07

SERIAL NO. 4468

Calibrator (Dilution System)

Brand	: API	Model	: 700
Last Cal. Date	: 05 August 2024	Serial No.	: 911

Reference Standard Gas

Standard Gas	: Nitric Oxide (NO)	Cylinder No.	: A00726SV
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026
		Cylinder Conc.	: 48.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.008
NO _x Span	400	400.3	0.075	400.0	1.011

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	509	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	315.2	°C	315 ± 5
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO _x Slope	1.011	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO _x Offset	1.0	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY :

CALIBRATION DATE :

APPROVED BY :

ISSUED DATE :

RECEIVED DATE :

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 07-Mar-25
AIR PRESSURE : 1009mbar \pm 1mbar CALIBRATION DATE : 07-Mar-25
AMBIENT TEMPERATURE : 24° C \pm 1° C RELATIVE HUMIDITY : 54 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) STANDARD WEIGHT SET	E2	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	0.00022

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
OFF-CENTER LOADING	0.0000

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY M
COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



Cert. No. : SP24020

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER

Manufacturer : PERKINELMER

Model : LAMBDA 25

Serial No.: 501S14123010

ID No.: SP03/58

Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,
CHOMPHON, CHATUCHAK,
BANGKOK 10900, THAILAND.

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 \pm 5) °C

Relative Humidity : (47.2 \pm 25) %

Received Date : 27 AUGUST 2024

Calibration Date : 27 AUGUST 2024

Date of Issue : 27 AUGUST 2024

Calibrated by :

Approved by :

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01

The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution

The calibration procedure used was based on ASTM E275-01, ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-1N2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

2. This result of calibration was found accurate as shown on date and place of calibration only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S14123010

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.0001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	1100 nm-190 nm
Scanning Speed	7.5 nm/min
Data Pitch	0.1 nm
Band width(Wavelength)	1.0 nm
Band width(Vis)	1.0 nm
Band width(Uv)	1.0 nm

Stray Light** UUC* Reading at 220 nm	
Transmission T(%)	Absorbance(A)
0.0117	3.8659

**Specific Acceptance :

Transmission \leq 1.0 T(%), Absorbance \geq 2.0 A

**Stray light not TISI Accredited

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95%

End of Calibration Certificate

เอกสารที่ 5-2

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากปล่อง



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_{g} (mmH ₂ O)
B01	1563	03/12/2024	0.999	49.77
B02	8002514	02/12/2024	0.997	49.92
B03	1503016	04/12/2024	0.996	49.68
B04	00006659	02/12/2024	0.998	49.59
B05	00007428	04/12/2024	0.996	49.73
R01	1561	05/12/2024	0.999	49.88
R02	8002513	03/12/2024	0.996	49.65
R03	1570	02/12/2024	1.002	50.04
R04	8002519	03/12/2024	0.997	49.45
R05	1503015	04/12/2024	1.003	49.98

Remark : Accept Value of y (test) is $0.97 < y < 1.03$
Accept Value of ΔH_{g} (test) is 46.7 ± 6.4 (mmH₂O)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72. Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	03/02/2025	0.84	0.84
B04	S	0.99	04/02/2025	0.85	0.84
B05	S	0.99	04/02/2025	0.84	0.83
B07	S	0.99	04/02/2025	0.84	0.85
B08	S	0.99	05/02/2025	0.84	0.84
B09	S	0.99	03/02/2025	0.85	0.84
B11	S	0.99	03/02/2025	0.84	0.84
B16	S	0.99	05/02/2025	0.84	0.83
B18	S	0.99	05/02/2025	0.85	0.84
B19	S	0.99	04/02/2025	0.84	0.84
B21	S	0.99	04/02/2025	0.85	0.84
B24	S	0.99	04/02/2025	0.84	0.84
B27	S	0.99	05/02/2025	0.84	0.85
B30	S	0.99	05/02/2025	0.84	0.84
B31	S	0.99	05/02/2025	0.85	0.84
B33	S	0.99	05/02/2025	0.84	0.84
B35	S	0.99	03/02/2025	0.85	0.84

Remark : Accept value of Cp (test) is 0.84 ± 0.01



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com.. www.spscon.com

Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	03/02/2025	0.84	0.83
B37	S	0.99	03/02/2025	0.85	0.84
B38	S	0.99	04/02/2025	0.84	0.85
B39	S	0.99	05/02/2025	0.84	0.83
B40	S	0.99	03/02/2025	0.84	0.84
B41	S	0.99	03/02/2025	0.84	0.84
B44	S	0.99	03/02/2025	0.85	0.84
B45	S	0.99	04/02/2025	0.84	0.83
B46	S	0.99	03/02/2025	0.84	0.84
B47	S	0.99	06/02/2025	0.84	0.85
B48	S	0.99	03/02/2025	0.84	0.84
B49	S	0.99	06/02/2025	0.85	0.84
B54	S	0.99	03/02/2025	0.84	0.84
B56	S	0.99	05/02/2025	0.84	0.84
B57	S	0.99	05/02/2025	0.85	0.84
B58	S	0.99	05/02/2025	0.84	0.85

Remark : Accept value of Cp (test) is 0.84 ± 0.01



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B01	SKC	224-PCXR4	262101	03/01/2025	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000
B02	SKC	224-PCXR4	626166	03/01/2025	1,000	1,500	2,000	997	1,499	1,996	0.998x - 0.140	1.000
B03	SKC	224-PCXR4	612968	06/01/2025	1,000	1,500	2,000	1,008	1,504	1,998	0.999x + 1.131	0.999
B04	SKC	224-PCXR4	602804	06/01/2025	1,000	1,500	2,000	994	1,505	2,004	1.010x - 17.826	1.000
B05	SKC	224-PCXR4	612693	07/01/2025	1,000	1,500	2,000	997	1,508	1,997	1.009x - 14.660	0.999
B06	SKC	224-PCXR4	262188	07/01/2025	1,000	1,500	2,000	1,005	1,493	2,002	0.995x + 7.108	1.000
B07	SKC	224-PCXR4	626262	07/01/2025	1,000	1,500	2,000	994	1,498	2,004	1.006x - 10.434	1.000
B08	SKC	224-PCXR4	626100	03/01/2025	1,000	1,500	2,000	1,014	1,505	2,010	1.004x - 2.659	0.999
B09	SKC	224-PCXR4	626479	06/01/2025	1,000	1,500	2,000	998	1,491	2,006	1.012x - 22.408	1.000
B10	SKC	224-PCXR4	091950	06/01/2025	1,000	1,500	2,000	999	1,507	2,007	1.010x - 15.236	1.000
B11	SKC	224-PCXR8	564315	06/01/2025	1,000	1,500	2,000	997	1,496	1,996	1.001x - 3.394	1.000
B12	SKC	224-PCXR4	034656	07/01/2025	1,000	1,500	2,000	1,005	1,503	2,004	1.011x - 19.282	0.999
B13	SKC	224-PCXR4	602073	07/01/2025	1,000	1,500	2,000	995	1,505	1,998	1.006x - 12.605	1.000
B14	SKC	224-PCXR4	626313	03/01/2025	1,000	1,500	2,000	1,003	1,506	2,007	1.007x - 8.152	1.000
B15	SKC	224-PCXR4	626474	06/01/2025	1,000	1,500	2,000	1,010	1,498	2,001	0.994x + 9.807	1.000
B16	SKC	224-PCXR4	626477	06/01/2025	1,000	1,500	2,000	998	1,507	2,002	1.013x - 22.572	0.999
B17	SKC	224-PCXR4	626860	06/01/2025	1,000	1,500	2,000	1,005	1,499	2,001	0.995x + 7.368	1.000
B18	SKC	224-PCXR4	691484	06/01/2025	1,000	1,500	2,000	1,008	1,494	2,002	0.993x + 10.346	1.000
B19	SKC	224-PCXR4	691599	06/01/2025	1,000	1,500	2,000	1,010	1,505	2,010	1.000x + 6.532	1.000
B20	SKC	224-PCXR4	691587	07/01/2025	1,000	1,500	2,000	1,006	1,512	2,009	1.002x - 1.671	0.999
B21	SKC	224-PCXR4	691531	07/01/2025	1,000	1,500	2,000	1,001	1,510	2,007	1.007x - 10.035	1.000
B22	SKC	224-PCXR4	691654	07/01/2025	1,000	1,500	2,000	1,015	1,513	2,012	0.999x + 8.423	0.999
B23	SKC	224-PCXR4	798393	07/01/2025	1,000	1,500	2,000	999	1,498	2,001	1.001x - 0.856	1.000
B24	SKC	224-PCXR4	626363	06/01/2025	1,000	1,500	2,000	1,001	1,506	2,006	1.007x - 12.177	0.999
B25	SKC	224-PCXR4	798489	06/01/2025	1,000	1,500	2,000	996	1,514	2,005	1.011x + 13.301	1.000
B26	SKC	224-PCXR4	798479	03/01/2025	1,000	1,500	2,000	998	1,509	2,002	1.005x - 9.187	1.000
B27	SKC	224-PCXR4	691673	03/01/2025	1,000	1,500	2,000	1,001	1,511	1,995	0.998x - 0.700	0.999
B28	SKC	224-PCXR4	691570	03/01/2025	1,000	1,500	2,000	1,004	1,513	2,006	1.001x + 1.779	1.000
B29	SKC	224-PCXR4	626472	03/01/2025	1,000	1,500	2,000	998	1,508	2,007	1.009x - 13.557	1.000
B30	SKC	224-PCXR4	691489	03/01/2025	1,000	1,500	2,000	1,003	1,503	2,012	1.008x - 10.099	1.000
B31	SKC	224-PCXR4	691509	06/01/2025	1,000	1,500	2,000	997	1,510	2,009	1.012x - 18.438	1.000
B32	SKC	224-PCXR4	091567	06/01/2025	1,000	1,500	2,000	1,014	1,517	2,007	0.995x + 11.654	0.999
B33	SKC	224-PCXR4	091756	06/01/2025	1,000	1,500	2,000	999	1,510	2,003	1.003x - 4.801	1.000
B34	SKC	224-PCXR4	612962	07/01/2025	1,000	1,500	2,000	1,001	1,511	2,008	1.008x - 11.354	0.999
B35	SKC	224-PCXR4	602682	07/01/2025	1,000	1,500	2,000	1,008	1,514	1,996	0.993x + 11.338	0.999
B36	SKC	224-PCXR4	626164	07/01/2025	1,000	1,500	2,000	1,005	1,506	2,007	1.003x - 2.339	1.000
B37	SKC	224-PCXR4	626256	07/01/2025	1,000	1,500	2,000	1,003	1,503	2,005	1.011x - 16.311	0.999
B38	SKC	224-PCXR4	626167	03/01/2025	1,000	1,500	2,000	1,006	1,514	2,007	1.000x + 0.712	0.999
B39	SKC	224-PCXR4	034637	06/01/2025	1,000	1,500	2,000	1,013	1,515	2,013	1.002x + 3.638	0.999
B40	SKC	224-PCXR4	798349	07/01/2025	1,000	1,500	2,000	999	1,508	2,001	1.000x - 1.691	1.000



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
 7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
 Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-B01	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	498.1	999.3	2001.2	0.997x + 4.404	1.000
H-B02	Dwyer	VFB-65	06/01/2025	500	1,000	2,000	499.2	998.1	2012.5	1.003x - 8.556	0.999
H-B03	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	502.4	1002.9	2008.6	1.000x - 2.203	1.000
H-B04	Dwyer	VFB-65	07/01/2025	500	1,000	2,000	501.7	997.4	1993.2	0.996x + 5.850	1.000
H-B05	Dwyer	VFB-65	07/01/2025	500	1,000	2,000	500.9	994.7	1984.4	0.985x + 17.991	0.999
H-B06	Dwyer	VFB-65	06/01/2025	500	1,000	2,000	502.5	997.1	1993.6	0.993x + 7.901	1.000
H-B07	Dwyer	VFB-65	06/01/2025	500	1,000	2,000	501.4	998.8	2009.5	1.001x + 0.428	1.000
H-B08	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	500.9	999.4	1993.8	0.997x + 2.266	0.999
H-B09	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	502.3	1004.1	2009.7	0.996x + 11.111	1.000
H-B10	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	498.6	999.5	2010.3	1.001x - 0.553	0.999



CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : HI-LIGHT
MODEL / TYPE : N/A
SERIAL NO. : N/A[64-220088-1]
CLID. NO. : 212301419
JOB CONTROL NO. : 240720076545
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

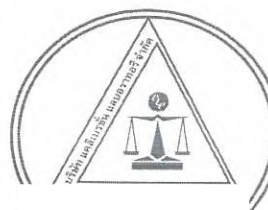
CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24 ROAD., JOMPOL,
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 20 July 2024

DATE OF ISSUED : 23 July 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :



Approved By :

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24076545

F3-011-05/12-23

page 1 of 3



@clccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220088-1]
DATE OF CALIBRATION	:	22 July 2024
DUE DATE OF CALIBRATION	:	22 July 2025

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPPP-05** according to **DKD-R 6-1** as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 741B S/N. 8295020 with Pressure Module Model 700PD5 S/N. 89404505.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MP-0040-24, Due Date 08 February 2025.

UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2$. It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q24076545

F3-011-05/12-23

page 2 of 3



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (inHg)	STD Reading (kPa)		Conversion to inHg		Correction (inHg)	
	Up	Down	Up	Down	Up	Down
0	0.00	0.00	0.0	0.0	0.0	0.0
-5	-15.58	-15.58	-4.6	-4.6	+0.4	+0.4
-10	-32.51	-32.84	-9.6	-9.7	+0.4	+0.3
-15	-49.44	-49.77	-14.6	-14.7	+0.4	+0.3
-20	-66.70	-66.70	-19.7	-19.7	+0.3	+0.3
-25	-83.63	-83.97	-24.7	-24.8	+0.3	+0.2
-30	-100.90	-100.90	-29.8	-29.8	+0.2	+0.2

Uncertainty of measurement ± 0.2 inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 43 of 67

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24076545

F3-011-05/12-23

page 3 of 3





CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY :

CALIBRATION DATE :

APPROVED BY :

ISSUED DATE :

RECEIVED DATE :

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 07-Mar-25
AIR PRESSURE : 1009mbar \pm 1mbar CALIBRATION DATE : 07-Mar-25
AMBIENT TEMPERATURE : 24° C \pm 1° C RELATIVE HUMIDITY : 54 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.00000	0.00000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	0.00022

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
OFF-CENTER LOADING	0.0000

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



Cert. No. : SP24020

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER

Manufacturer : PERKINELMER

Model : LAMBDA 25

Serial No.: 501S14123010

ID No.: SP03/58

Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,
CHOMPHON, CHATUCHAK,
BANGKOK 10900, THAILAND.

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 \pm 5) °C

Relative Humidity : (47.2 \pm 25) %

Received Date : 27 AUGUST 2024

Calibration Date : 27 AUGUST 2024

Date of Issue : 27 AUGUST 2024

Calibrated by :

Approved by :

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01

The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution

The calibration procedure used was based on ASTM E275-01, ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-1N2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

2. This result of calibration was found accurate as shown on date and place of calibration only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiporn.com

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S14123010

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.0001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	1100 nm-190 nm
Scanning Speed	7.5 nm/min
Data Pitch	0.1 nm
Band width(Wavelength)	1.0 nm
Band width(Vis)	1.0 nm
Band width(Uv)	1.0 nm

Stray Light** UUC* Reading at 220 nm	
Transmission T(%)	Absorbance(A)
0.0117	3.8659

**Specific Acceptance :

Transmission \leq 1.0 T(%), Absorbance \geq 2.0 A

**Stray light not TISI Accredited

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95%

End of Calibration Certificate



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	04 February 2025	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 28 October 2024			Serial No. : 201-S		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.5 °C		% RH : 50	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	40.04	0.100	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4015.2	mV	2500-4800 mV		
CO Reference	3949.4	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	808	CC/Min	800 ± 10%		
Sample Temperature	48.4	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.5	°C	68 ± 2		
Box Temperature	30.7	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3031.9	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

เอกสารที่ 5-3

เอกสารสอบเทียบเครื่องมือการตรวจคุณภาพอากาศ
ในสถานประกอบการ (Working Area)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B01	SKC	224-PCXR4	262101	03/01/2025	1,000	1,500	2,000	996	1,503	1,999	1.003x – 5.913	1.000
B02	SKC	224-PCXR4	626166	03/01/2025	1,000	1,500	2,000	997	1,499	1,996	0.998x - 0.140	1.000
B03	SKC	224-PCXR4	612968	06/01/2025	1,000	1,500	2,000	1,008	1,504	1,998	0.999x + 1.131	0.999
B04	SKC	224-PCXR4	602804	06/01/2025	1,000	1,500	2,000	994	1,505	2,004	1.010x – 17.826	1.000
B05	SKC	224-PCXR4	612693	07/01/2025	1,000	1,500	2,000	997	1,508	1,997	1.009x – 14.660	0.999
B06	SKC	224-PCXR4	262188	07/01/2025	1,000	1,500	2,000	1,005	1,493	2,002	0.995x + 7.108	1.000
B07	SKC	224-PCXR4	626262	07/01/2025	1,000	1,500	2,000	994	1,498	2,004	1.006x - 10.434	1.000
B08	SKC	224-PCXR4	626100	03/01/2025	1,000	1,500	2,000	1,014	1,505	2,010	1.004x - 2.659	0.999
B09	SKC	224-PCXR4	626479	06/01/2025	1,000	1,500	2,000	998	1,491	2,006	1.012x - 22.408	1.000
B10	SKC	224-PCXR4	091950	06/01/2025	1,000	1,500	2,000	999	1,507	2,007	1.010x – 15.236	1.000
B11	SKC	224-PCXR8	564315	06/01/2025	1,000	1,500	2,000	997	1,496	1,996	1.001x - 3.394	1.000
B12	SKC	224-PCXR4	034656	07/01/2025	1,000	1,500	2,000	1,005	1,503	2,004	1.011x - 19.282	0.999
B13	SKC	224-PCXR4	602073	07/01/2025	1,000	1,500	2,000	995	1,505	1,998	1.006x - 12.605	1.000
B14	SKC	224-PCXR4	626313	03/01/2025	1,000	1,500	2,000	1,003	1,506	2,007	1.007x - 8.152	1.000
B15	SKC	224-PCXR4	626474	06/01/2025	1,000	1,500	2,000	1,010	1,498	2,001	0.994x + 9.807	1.000
B16	SKC	224-PCXR4	626477	06/01/2025	1,000	1,500	2,000	998	1,507	2,002	1.013x - 22.572	0.999
B17	SKC	224-PCXR4	626860	06/01/2025	1,000	1,500	2,000	1,005	1,499	2,001	0.995x + 7.368	1.000
B18	SKC	224-PCXR4	691484	06/01/2025	1,000	1,500	2,000	1,008	1,494	2,002	0.993x + 10.346	1.000
B19	SKC	224-PCXR4	691599	06/01/2025	1,000	1,500	2,000	1,010	1,505	2,010	1.000x + 6.532	1.000
B20	SKC	224-PCXR4	691587	07/01/2025	1,000	1,500	2,000	1,006	1,512	2,009	1.002x – 1.671	0.999
B21	SKC	224-PCXR4	691531	07/01/2025	1,000	1,500	2,000	1,001	1,510	2,007	1.007x – 10.035	1.000
B22	SKC	224-PCXR4	691654	07/01/2025	1,000	1,500	2,000	1,015	1,513	2,012	0.999x + 8.423	0.999
B23	SKC	224-PCXR4	798393	07/01/2025	1,000	1,500	2,000	999	1,498	2,001	1.001x - 0.856	1.000
B24	SKC	224-PCXR4	626363	06/01/2025	1,000	1,500	2,000	1,001	1,506	2,006	1.007x – 12.177	0.999
B25	SKC	224-PCXR4	798489	06/01/2025	1,000	1,500	2,000	996	1,514	2,005	1.011x + 13.301	1.000
B26	SKC	224-PCXR4	798479	03/01/2025	1,000	1,500	2,000	998	1,509	2,002	1.005x - 9.187	1.000
B27	SKC	224-PCXR4	691673	03/01/2025	1,000	1,500	2,000	1,001	1,511	1,995	0.998x - 0.700	0.999
B28	SKC	224-PCXR4	691570	03/01/2025	1,000	1,500	2,000	1,004	1,513	2,006	1.001x + 1.779	1.000
B29	SKC	224-PCXR4	626472	03/01/2025	1,000	1,500	2,000	998	1,508	2,007	1.009x – 13.557	1.000
B30	SKC	224-PCXR4	691489	03/01/2025	1,000	1,500	2,000	1,003	1,503	2,012	1.008x – 10.099	1.000
B31	SKC	224-PCXR4	691509	06/01/2025	1,000	1,500	2,000	997	1,510	2,009	1.012x - 18.438	1.000
B32	SKC	224-PCXR4	091567	06/01/2025	1,000	1,500	2,000	1,014	1,517	2,007	0.995x + 11.654	0.999
B33	SKC	224-PCXR4	091756	06/01/2025	1,000	1,500	2,000	999	1,510	2,003	1.003x – 4.801	1.000
B34	SKC	224-PCXR4	612962	07/01/2025	1,000	1,500	2,000	1,001	1,511	2,008	1.008x – 11.354	0.999
B35	SKC	224-PCXR4	602682	07/01/2025	1,000	1,500	2,000	1,008	1,514	1,996	0.993x + 11.338	0.999
B36	SKC	224-PCXR4	626164	07/01/2025	1,000	1,500	2,000	1,005	1,506	2,007	1.003x - 2.339	1.000
B37	SKC	224-PCXR4	626256	07/01/2025	1,000	1,500	2,000	1,003	1,503	2,005	1.011x - 16.311	0.999
B38	SKC	224-PCXR4	626167	03/01/2025	1,000	1,500	2,000	1,006	1,514	2,007	1.000x + 0.712	0.999
B39	SKC	224-PCXR4	034637	06/01/2025	1,000	1,500	2,000	1,013	1,515	2,013	1.002x + 3.638	0.999
B40	SKC	224-PCXR4	798349	07/01/2025	1,000	1,500	2,000	999	1,508	2,001	1.000x - 1.691	1.000



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	07/01/2025	1,000	1,500	2,000	996	1,512	2,005	1.008x - 10.246	1.000
B42	SKC	224-PCXR4	626041	07/01/2025	1,000	1,500	2,000	995	1,499	2,002	1.002x - 2.343	1.000
B43	SKC	224-PCXR4	034636	03/01/2025	1,000	1,500	2,000	999	1,495	1,997	0.996x + 2.703	1.000
B44	SKC	224-PCXR8	529341	03/01/2025	1,000	1,500	2,000	998	1,510	2,003	1.009x - 16.871	0.999
B45	SKC	224-PCXR8	529594	03/01/2025	1,000	1,500	2,000	997	1,508	2,004	1.012x - 21.113	0.999
B46	SKC	224-PCXR8	566743	03/01/2025	1,000	1,500	2,000	996	1,497	2,003	1.010x - 16.955	1.000
B47	SKC	224-PCXR8	566747	03/01/2025	1,000	1,500	2,000	1,002	1,504	2,001	1.003x - 2.758	1.000
B48	SKC	224-PCXR8	566753	03/01/2025	1,000	1,500	2,000	998	1,512	2,002	1.008x -13.876	0.999
B49	SKC	224-PCXR8	566780	03/01/2025	1,000	1,500	2,000	997	1,497	1,997	1.002x - 5.465	1.000
B50	SKC	224-PCXR8	500400	03/01/2025	1,000	1,500	2,000	996	1,503	1,999	1.003x - 7.316	1.000
B51	SKC	224-PCXR8	500363	06/01/2025	1,000	1,500	2,000	1,003	1,505	1,998	0.995x + 8.579	1.000
B52	SKC	224-PCXR8	093186	06/01/2025	1,000	1,500	2,000	1,002	1,496	1,999	0.999x - 0.396	1.000
B53	SKC	224-PCXR8	707670	07/01/2025	1,000	1,500	2,000	997	1,505	2,005	1.010x - 19.569	0.999
B54	SKC	224-PCXR3	509821	07/01/2025	1,000	1,500	2,000	1,004	1,506	2,002	1.002x - 0.736	1.000
B55	SKC	224-PCXR3	510710	07/01/2025	1,000	1,500	2,000	998	1,501	2,001	1.003x - 5.629	1.000
B56	SKC	224-PCXR3	511450	07/01/2025	1,000	1,500	2,000	995	1,509	2,007	1.013x - 22.400	0.999
B57	SKC	224-PCXR3	510798	07/01/2025	1,000	1,500	2,000	999	1,498	1,996	0.996x + 4.985	1.000
B58	SKC	224-PCXR3	509852	06/01/2025	1,000	1,500	2,000	1,002	1,503	2,005	1.009x - 13.249	1.000
B59	SKC	224-PCXR3	509862	06/01/2025	1,000	1,500	2,000	996	1,506	2,007	1.015x - 25.718	0.999
B60	SKC	224-PCXR3	512655	06/01/2025	1,000	1,500	2,000	1,012	1,504	2,001	0.995x + 10.338	1.000
B61	SKC	224-PCXR3	503915	03/01/2025	1,000	1,500	2,000	1,003	1,507	2,010	1.010x - 13.769	1.000
B62	SKC	224-PCXR3	505975	03/01/2025	1,000	1,500	2,000	1,004	1,505	2,008	1.012x - 17.586	0.999
B63	SKC	224-PCXR3	511432	03/01/2025	1,000	1,500	2,000	999	1,503	2,003	1.013x - 21.568	0.999
B64	SKC	224-PCXR3	508302	06/01/2025	1,000	1,500	2,000	996	1,506	2,006	1.010x - 15.623	1.000
B65	SKC	224-PCXR3	508310	06/01/2025	1,000	1,500	2,000	1,003	1,502	2,002	1.001x + 1.279	1.000
B66	SKC	224-PCXR3	509861	06/01/2025	1,000	1,500	2,000	1,004	1,505	2,008	1.004x - 7.200	1.000
B67	SKC	224-PCXR3	506295	06/01/2025	1,000	1,500	2,000	997	1,497	2,007	1.011x - 22.995	0.999
B68	SKC	224-PCXR3	505872	07/01/2025	1,000	1,500	2,000	1,001	1,493	1,999	0.998x - 1.515	1.000
B69	SKC	224-PCXR3	508375	07/01/2025	1,000	1,500	2,000	995	1,508	2,003	1.013x - 23.639	0.999
B70	SKC	224-PCXR3	510623	07/01/2025	1,000	1,500	2,000	1,004	1,502	2,007	1.011x - 17.470	0.999
B71	SKC	224-PCXR3	508367	06/01/2025	1,000	1,500	2,000	1,003	1,504	2,008	1.016x - 24.787	0.999
B72	SKC	224-PCXR3	505977	06/01/2025	1,000	1,500	2,000	1,008	1,496	2,007	1.001x + 0.904	1.000
B73	SKC	224-PCXR3	512606	06/01/2025	1,000	1,500	2,000	1,003	1,502	2,003	1.007x - 15.456	0.999
B74	SKC	224-PCXR3	505993	06/01/2025	1,000	1,500	2,000	1,004	1,501	1,999	1.000x - 0.624	1.000
B75	SKC	224-PCXR3	509820	06/01/2025	1,000	1,500	2,000	996	1,510	2,003	1.010x - 17.886	0.999
B76	SKC	224-PCXR3	509811	07/01/2025	1,000	1,500	2,000	994	1,509	2,008	1.013x - 21.308	1.000
B77	SKC	224-PCXR3	508301	07/01/2025	1,000	1,500	2,000	1,002	1,491	2,006	1.006x - 10.302	1.000
B78	SKC	224-PCXR3	510677	07/01/2025	1,000	1,500	2,000	1,005	1,504	2,007	1.012x - 19.937	0.999
B79	SKC	224-PCXR3	510920	06/01/2025	1,000	1,500	2,000	1,003	1,503	2,006	1.015x - 24.223	0.999



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72. Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature . 25 \pm 3 $^{\circ}$ C
Pressure . 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B80	SKC	224-PCXR3	504569	06/01/2025	1,000	1,500	2,000	999	1,497	2,011	1.009x - 11.282	1.000
B81	SKC	224-PCXR3	503480	03/01/2025	1,000	1,500	2,000	1,004	1,505	2,008	1.010x - 16.107	0.999
B82	SKC	224-PCXR3	505673	03/01/2025	1,000	1,500	2,000	995	1,509	2,005	1.014x - 24.323	0.999
B83	SKC	224-PCXR3	510785	07/01/2025	1,000	1,500	2,000	999	1,506	1,998	0.998x + 5.669	1.000
B84	SKC	224-PCXR3	508333	07/01/2025	1,000	1,500	2,000	993	1,492	2,004	1.009x - 21.129	1.000
B85	SKC	224-PCXR3	505757	07/01/2025	1,000	1,500	2,000	1,005	1,503	2,008	1.007x - 9.639	1.000
B86	SKC	224-PCXR3	512625	06/01/2025	1,000	1,500	2,000	996	1,495	2,001	1.005x - 11.406	1.000
B87	SKC	224-PCXR3	504324	06/01/2025	1,000	1,500	2,000	997	1,498	1,999	1.004x - 12.097	1.000
B88	SKC	224-PCXR3	508307	06/01/2025	1,000	1,500	2,000	994	1,502	1,994	0.999x - 1.619	1.000
B89	SKC	224-PCXR3	509860	06/01/2025	1,000	1,500	2,000	995	1,507	2,003	1.008x - 14.844	1.000
B90	SKC	224-PCXR3	508366	07/01/2025	1,000	1,500	2,000	997	1,496	1,995	0.999x - 1.143	1.000
B91	SKC	224-PCXR3	510919	07/01/2025	1,000	1,500	2,000	1,005	1,503	2,012	1.008x - 11.670	0.999
B92	SKC	224-PCXR3	510987	03/01/2025	1,000	1,500	2,000	999	1,494	2,010	1.013x - 24.882	0.999
B93	SKC	224-PCXR3	509845	03/01/2025	1,000	1,500	2,000	997	1,507	1,998	1.002x - 3.102	1.000



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
 7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
 Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-B01	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	498.1	999.3	2001.2	0.997x + 4.404	1.000
H-B02	Dwyer	VFB-65	06/01/2025	500	1,000	2,000	499.2	998.1	2012.5	1.003x - 8.556	0.999
H-B03	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	502.4	1002.9	2008.6	1.000x - 2.203	1.000
H-B04	Dwyer	VFB-65	07/01/2025	500	1,000	2,000	501.7	997.4	1993.2	0.996x + 5.850	1.000
H-B05	Dwyer	VFB-65	07/01/2025	500	1,000	2,000	500.9	994.7	1984.4	0.985x + 17.991	0.999
H-B06	Dwyer	VFB-65	06/01/2025	500	1,000	2,000	502.5	997.1	1993.6	0.993x + 7.901	1.000
H-B07	Dwyer	VFB-65	06/01/2025	500	1,000	2,000	501.4	998.8	2009.5	1.001x + 0.428	1.000
H-B08	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	500.9	999.4	1993.8	0.997x + 2.266	0.999
H-B09	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	502.3	1004.1	2009.7	0.996x + 11.111	1.000
H-B10	Dwyer	VFB-65	03/01/2025	500	1,000	2,000	498.6	999.5	2010.3	1.001x - 0.553	0.999



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B01	SKC	224-PCXR4	262101	01/04/2025	1,000	1,500	2,000	998	1,494	2,002	1.001x - 3.594	1.000
B02	SKC	224-PCXR4	626166	01/04/2025	1,000	1,500	2,000	995	1,508	2,003	1.008x - 12.605	1.000
B03	SKC	224-PCXR4	612968	03/04/2025	1,000	1,500	2,000	1,003	1,502	2,006	1.006x - 7.796	1.000
B04	SKC	224-PCXR4	602804	03/04/2025	1,000	1,500	2,000	1,001	1,499	2,013	1.004x - 7.060	0.999
B05	SKC	224-PCXR4	612693	03/04/2025	1,000	1,500	2,000	1,004	1,498	2,007	1.003x - 2.455	1.000
B06	SKC	224-PCXR4	262188	03/04/2025	1,000	1,500	2,000	1,003	1,512	2,004	1.000x + 0.696	1.000
B07	SKC	224-PCXR4	626262	03/04/2025	1,000	1,500	2,000	1,012	1,504	1,996	0.994x + 10.330	0.999
B08	SKC	224-PCXR4	626100	02/04/2025	1,000	1,500	2,000	996	1,511	2,007	1.010x - 14.048	1.000
B09	SKC	224-PCXR4	626479	03/04/2025	1,000	1,500	2,000	999	1,510	2,003	1.003x - 4.677	1.000
B10	SKC	224-PCXR4	091950	03/04/2025	1,000	1,500	2,000	1,002	1,498	2,004	1.004x - 6.544	1.000
B11	SKC	224-PCXR8	564315	04/04/2025	1,000	1,500	2,000	1,013	1,505	2,010	1.002x + 2.171	1.000
B12	SKC	224-PCXR4	034656	04/04/2025	1,000	1,500	2,000	1,004	1,506	2,009	1.008x - 9.391	1.000
B13	SKC	224-PCXR4	602073	03/04/2025	1,000	1,500	2,000	1,001	1,497	2,012	1.009x - 9.643	1.000
B14	SKC	224-PCXR4	626313	03/04/2025	1,000	1,500	2,000	1,004	1,515	1,997	1.002x - 1.275	0.999
B15	SKC	224-PCXR4	626474	03/04/2025	1,000	1,500	2,000	999	1,497	1,996	1.000x - 2.511	1.000
B16	SKC	224-PCXR4	626477	03/04/2025	1,000	1,500	2,000	1,012	1,504	2,007	0.997x + 8.160	1.000
B17	SKC	224-PCXR4	626860	01/04/2025	1,000	1,500	2,000	997	1,506	1,999	1.001x - 1.435	1.000
B18	SKC	224-PCXR4	691484	02/04/2025	1,000	1,500	2,000	1,007	1,493	2,005	0.998x + 4.350	1.000
B19	SKC	224-PCXR4	691599	03/04/2025	1,000	1,500	2,000	1,004	1,513	2,001	1.003x - 2.043	1.000
B20	SKC	224-PCXR4	691587	03/04/2025	1,000	1,500	2,000	999	1,504	1,998	0.999x + 0.556	1.000
B21	SKC	224-PCXR4	691531	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,997	1.003x - 7.572	0.999
B22	SKC	224-PCXR4	691654	04/04/2025	1,000	1,500	2,000	1,008	1,504	2,006	1.005x - 4.941	1.000
B23	SKC	224-PCXR4	798393	04/04/2025	1,000	1,500	2,000	995	1,499	1,998	1.002x - 4.953	1.000
B24	SKC	224-PCXR4	626363	04/04/2025	1,000	1,500	2,000	1,002	1,501	1,996	0.999x - 1.539	1.000
B25	SKC	224-PCXR4	798489	04/04/2025	1,000	1,500	2,000	1,010	1,515	2,001	0.990x + 16.203	0.999
B26	SKC	224-PCXR4	798479	03/04/2025	1,000	1,500	2,000	999	1,492	1,999	0.998x - 0.596	1.000
B27	SKC	224-PCXR4	691673	03/04/2025	1,000	1,500	2,000	996	1,498	2,002	1.004x - 6.496	1.000
B28	SKC	224-PCXR4	691570	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,994	0.993x + 8.068	1.000
B29	SKC	224-PCXR4	626472	03/04/2025	1,000	1,500	2,000	1,001	1,501	1,996	0.994x + 9.367	1.000
B30	SKC	224-PCXR4	691489	01/04/2025	1,000	1,500	2,000	996	1,507	2,003	1.006x - 12.489	1.000
B31	SKC	224-PCXR4	691509	02/04/2025	1,000	1,500	2,000	1,010	1,509	2,008	1.003x - 3.858	0.999
B32	SKC	224-PCXR4	091567	02/04/2025	1,000	1,500	2,000	996	1,497	1,997	0.998x - 0.764	1.000
B33	SKC	224-PCXR4	091756	03/04/2025	1,000	1,500	2,000	998	1,508	2,006	1.007x - 13.441	0.999
B34	SKC	224-PCXR4	612962	03/04/2025	1,000	1,500	2,000	1,004	1,494	1,995	0.993 + 8.471	1.000
B35	SKC	224-PCXR4	602682	03/04/2025	1,000	1,500	2,000	999	1,491	2,001	1.000x - 2.275	1.000
B36	SKC	224-PCXR4	626164	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,997	0.995x + 5.109	1.000
B37	SKC	224-PCXR4	626256	03/04/2025	1,000	1,500	2,000	998	1,503	1,996	0.996x + 5.729	1.000
B38	SKC	224-PCXR4	626167	03/04/2025	1,000	1,500	2,000	996	1,509	2,004	1.008x - 15.248	0.999
B39	SKC	224-PCXR4	034637	02/04/2025	1,000	1,500	2,000	1,006	1,505	2,010	1.011x - 15.064	0.999
B40	SKC	224-PCXR4	798349	03/04/2025	1,000	1,500	2,000	997	1,510	2,008	1.012x - 19.381	1.000



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com.. www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	03/04/2025	1,000	1,500	2,000	1,005	1,502	2,004	1.005x - 8.923	1.000
B42	SKC	224-PCXR4	626041	03/04/2025	1,000	1,500	2,000	1,004	1,501	2,008	1.009x - 13.856	1.000
B43	SKC	224-PCXR4	034636	01/04/2025	1,000	1,500	2,000	1,012	1,497	1,996	0.990x + 15.132	1.000
B44	SKC	224-PCXR8	529341	01/04/2025	1,000	1,500	2,000	1,011	1,511	2,008	1.002x - 0.860	0.999
B45	SKC	224-PCXR8	529594	04/04/2025	1,000	1,500	2,000	993	1,512	2,003	1.009x - 14.476	1.000
B46	SKC	224-PCXR8	566743	04/04/2025	1,000	1,500	2,000	1,008	1,508	2,008	1.000x - 0.100	0.999
B47	SKC	224-PCXR8	566747	04/04/2025	1,000	1,500	2,000	999	1,510	2,010	1.010x - 14.444	1.000
B48	SKC	224-PCXR8	566753	01/04/2025	1,000	1,500	2,000	1,010	1,506	2,006	0.999x + 2.782	1.000
B49	SKC	224-PCXR8	566780	04/04/2025	1,000	1,500	2,000	1,003	1,504	2,004	1.003x - 2.183	1.000
B50	SKC	224-PCXR8	500400	04/04/2025	1,000	1,500	2,000	1,002	1,493	1,995	0.994x + 5.841	1.000
B51	SKC	224-PCXR8	500363	04/04/2025	1,000	1,500	2,000	998	1,511	2,011	1.013x - 19.465	0.999
B52	SKC	224-PCXR8	093186	02/04/2025	1,000	1,500	2,000	997	1,505	2,006	1.008x - 12.641	1.000
B53	SKC	224-PCXR8	707670	02/04/2025	1,000	1,500	2,000	1,004	1,503	2,007	1.007x - 7.992	1.000
B54	SKC	224-PCXR3	509821	02/04/2025	1,000	1,500	2,000	1,005	1,504	2,008	1.010x - 15.060	0.999
B55	SKC	224-PCXR3	510710	02/04/2025	1,000	1,500	2,000	1,001	1,495	1,997	0.996x + 5.073	1.000
B56	SKC	224-PCXR3	511450	02/04/2025	1,000	1,500	2,000	1,005	1,494	1,996	0.991x - 13.385	1.000
B57	SKC	224-PCXR3	510798	03/04/2025	1,000	1,500	2,000	997	1,511	2,009	1.014x - 21.540	0.999
B58	SKC	224-PCXR3	509852	03/04/2025	1,000	1,500	2,000	1,006	1,493	2,002	1.001x - 4.094	1.000
B59	SKC	224-PCXR3	509862	03/04/2025	1,000	1,500	2,000	995	1,502	2,003	1.012x - 21.564	1.000
B60	SKC	224-PCXR3	512655	03/04/2025	1,000	1,500	2,000	998	1,507	2,004	1.010x - 18.510	0.999
B61	SKC	224-PCXR3	503915	03/04/2025	1,000	1,500	2,000	997	1,499	2,001	1.002x - 4.374	1.000
B62	SKC	224-PCXR3	505975	01/04/2025	1,000	1,500	2,000	1,002	1,503	2,005	1.008x - 11.138	1.000
B63	SKC	224-PCXR3	511432	04/04/2025	1,000	1,500	2,000	998	1,502	1,996	0.996x + 3.970	1.000
B64	SKC	224-PCXR3	508302	04/04/2025	1,000	1,500	2,000	1,005	1,509	2,008	1.009x - 10.402	1.000
B65	SKC	224-PCXR3	508310	04/04/2025	1,000	1,500	2,000	1,004	1,503	2,007	1.010x - 14.088	1.000
B66	SKC	224-PCXR3	509861	04/04/2025	1,000	1,500	2,000	1,003	1,504	2,010	1.008x - 12.369	1.000
B67	SKC	224-PCXR3	506295	04/04/2025	1,000	1,500	2,000	1,002	1,498	2,004	0.998x + 4.290	1.000
B68	SKC	224-PCXR3	505872	04/04/2025	1,000	1,500	2,000	999	1,504	1,998	1.000x + 0.436	1.000
B69	SKC	224-PCXR3	508375	02/04/2025	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
B70	SKC	224-PCXR3	510623	02/04/2025	1,000	1,500	2,000	996	1,497	2,005	1.005x - 8.735	1.000
B71	SKC	224-PCXR3	508367	02/04/2025	1,000	1,500	2,000	1,013	1,505	2,009	1.000x + 3.294	0.999
B72	SKC	224-PCXR3	505977	02/04/2025	1,000	1,500	2,000	997	1,494	2,003	1.006x - 11.350	1.000
B73	SKC	224-PCXR3	512606	01/04/2025	1,000	1,500	2,000	1,010	1,507	2,004	0.998x + 5.129	1.000
B74	SKC	224-PCXR3	505993	01/04/2025	1,000	1,500	2,000	998	1,499	2,010	1.009x - 11.942	1.000
B75	SKC	224-PCXR3	509820	01/04/2025	1,000	1,500	2,000	995	1,511	2,004	1.011x - 18.966	0.999
B76	SKC	224-PCXR3	509811	01/04/2025	1,000	1,500	2,000	998	1,504	2,010	1.012x - 20.993	0.999
B77	SKC	224-PCXR3	508301	03/04/2025	1,000	1,500	2,000	1,007	1,509	2,008	1.001x + 3.750	1.000
B78	SKC	224-PCXR3	510677	04/04/2025	1,000	1,500	2,000	998	1,508	2,001	1.003x - 3.278	1.000
B79	SKC	224-PCXR3	510920	04/04/2025	1,000	1,500	2,000	1,001	1,501	1,994	0.999x - 1.819	1.000



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
 7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
 Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Calibration Data											
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-B01	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	499.1	997.5	1996.2	0.992x + 10.557	1.000
H-B02	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	501.5	996.9	2004.4	1.002x - 0.966	1.000
H-B03	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	498.9	997.4	1996.5	0.997x - 0.674	1.000
H-B04	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	498.0	996.5	2007.8	1.001x - 8.142	0.999
H-B05	Dwyer	VFB-65	02/04/2025	500	1,000	2,000	501.2	998.6	1993.7	0.994x + 6.199	1.000
H-B06	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	499.7	995.3	1989.1	0.995x + 1.374	0.999
H-B07	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	500.1	999.7	2006.4	0.998x - 1.014	1.000
H-B08	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	499.8	997.4	1994.8	0.993x + 6.689	1.000
H-B09	Dwyer	VFB-65	04/04/2025	500	1,000	2,000	498.2	997.1	2005.6	0.999x + 0.065	0.999
H-B10	Dwyer	VFB-65	04/04/2025	500	1,000	2,000	501.2	998.4	2009.2	0.998x + 3.713	1.000



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY :

CALIBRATION DATE :

APPROVED BY :

ISSUED DATE :

RECEIVED DATE :

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 07-Mar-25
AIR PRESSURE : 1009mbar \pm 1mbar CALIBRATION DATE : 07-Mar-25
AMBIENT TEMPERATURE : 24° C \pm 1° C RELATIVE HUMIDITY : 54 %RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	0.00022

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
OFF-CENTER LOADING	0.0000

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A
COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



เอกสารที่ 5-4

เอกสารสอบเทียบเครื่องมือการตรวจระดับเสียง

โดยทั่วไปและเสียงในสถานประกอบการ

(Working Area)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co.,Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N4106495.
7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.65	± 0.50	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Approved by :

Date of Calibration : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011267022200795001

End of Certificate

2 / 2

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Noise B_064/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	21 February 2025
		Due Date	21 February 2026

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B17	ACO	6236	00172042	20 February 2025	93.8	93.9
ACO-B24	ACO	6236	00182005	20 February 2025	93.8	93.9
ACO-B27	ACO	6236	00182008	20 February 2025	93.9	93.9
ACO-B29	ACO	6236	00182011	20 February 2025	93.9	93.9
ACO-R35	ACO	6236	00192047	20 February 2025	93.9	93.9
ACO-R45	ACO	6236	00192057	20 February 2025	93.7	93.9
ACO-R54	ACO	6236	00222307	20 February 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24080586-7

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 192052

ID. Number : R-40

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 30 Aug 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 30 Aug 2024

Location of Calibration : In-Lab

Recommend Due Date : 30 Aug 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 31 Aug 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24080586-7

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24080586-7

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24080586-13

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 192053

ID. Number : R-41

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 30 Aug 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 30 Aug 2024

Location of Calibration : In-Lab

Recommend Due Date : 30 Aug 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 31 Aug 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24080586-13

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate Number : SPR24080586-13

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	114.0	114.0	0.0	0.0	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24080586-8

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 192062

ID. Number : R-50

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 30 Aug 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 30 Aug 2024

Location of Calibration : In-Lab

Recommend Due Date : 30 Aug 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 31 Aug 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24080586-8

Page : 2 of 3

Reference Standards

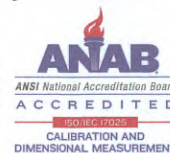
Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24080586-8

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com, www.spscon.com

Noise B_043/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	04 March 2024
		Due Date	04 March 2025

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R40	ACO	6236	00192052	21 February 2025	94.1	93.9
ACO-R41	ACO	6236	00192053	21 February 2025	93.9	93.9
ACO-R50	ACO	6236	00192062	21 February 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24030285-11

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 192027

ID. Number : ACO-B36

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Relative Humidity : $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPE-04-01

Received Date : 19 Mar 2024

Calibration Date : 23 Mar 2024

Recommend Due Date : 23 Mar 2025

Date of Issue : 24 Mar 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24030285-11

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate Number : SPR24030285-11

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	114.1	114.1	0.1	0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	114.1	113.9	0.1	-0.1	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24030285-12

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 192032

ID. Number : ACO-B41

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 19 Mar 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 23 Mar 2024

Location of Calibration : In-Lab

Recommend Due Date : 23 Mar 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 24 Mar 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand)



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24030285-12

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate Number : SPR24030285-12

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24030285-13

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 192034

ID. Number : ACO-B43

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 19 Mar 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 23 Mar 2024

Location of Calibration : In-Lab

Recommend Due Date : 23 Mar 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 24 Mar 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24030285-13

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate Number : SPR24030285-13

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
 7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
 Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Noise B_229/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	21 February 2025
		Due Date	21 February 2026

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B36	ACO	6236	00192027	06 June 2025	93.9	93.9
ACO-B41	ACO	6236	00192032	06 June 2025	93.8	93.9
ACO-B43	ACO	6236	00192034	06 June 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

เอกสารที่ 5-5

เอกสารสอบเทียบเครื่องมือการตรวจค่าความร้อน
ในสถานประกอบการ (Working Area)



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24030285-2

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 32

Serial Number : TPH050015

ID. Number : B32

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 19 Mar 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 20 Mar 2024

Location of Calibration : In-Lab

Recommend Due Date : 20 Mar 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 21 Mar 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24030285-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24030285-2

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.012	30.0	-0.012	0.20
35.0	35.010	35.0	-0.010	0.20
40.0	40.015	40.1	0.085	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.012	30.0	-0.012	0.20
35.0	35.010	35.0	-0.010	0.20
40.0	40.015	40.1	0.085	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Humidity Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.012	30.0	-0.012	0.20
35.0	35.010	35.0	-0.010	0.20
40.0	40.015	40.1	0.085	0.20

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24100363-2

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 32

Serial Number : TPK120034

ID. Number : B33

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 21 Oct 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 21 Oct 2024

Location of Calibration : In-Lab

Recommend Due Date : 21 Oct 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 22 Oct 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24100363-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

Traceability

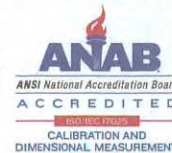
This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd



ID LINE : IEC17025



Result of Calibration

Certificate Number : SPR24100363-2

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.018	30.3	0.282	0.20
35.0	35.016	35.3	0.284	0.20
40.0	40.020	40.3	0.280	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.018	30.3	0.282	0.20
35.0	35.016	35.3	0.284	0.20
40.0	40.020	40.3	0.280	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.018	30.3	0.282	0.20
35.0	35.016	35.3	0.284	0.20
40.0	40.020	40.3	0.280	0.20

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24080586-1

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEN040005

ID. Number : R04

Environmental Conditions

Ambient Temperature : $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Received Date : 30 Aug 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 30 Aug 2024

Location of Calibration : In-Lab

Recommend Due Date : 30 Aug 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 31 Aug 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24080586-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24080586-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.025	30.1	0.075	0.20
35.0	35.020	35.1	0.080	0.20
40.0	40.018	40.1	0.082	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.025	30.0	-0.025	0.20
35.0	35.020	35.0	-0.020	0.20
40.0	40.018	40.0	-0.018	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.025	30.2	0.175	0.20
35.0	35.020	35.2	0.180	0.20
40.0	40.018	40.2	0.182	0.20

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2$, providing a level of confidence approximately 95%.

- End of Certificate -



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com., www.spscon.com

Heat B_044_1

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B32	Verification Date	: 21 February 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 32	Barometric Pressure	: 1011 mmbar
Serial No.	: TPH050015	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.3	-0.2	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			



Heat B_044_2

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B33	Verification Date	: 21 February 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 32	Barometric Pressure	: 1011 mmbar
Serial No.	: TPK120034	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	46.9	0.2	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.3	0.0	± 0.5
UUC* = UNIT UNDER CALIBRATION			



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

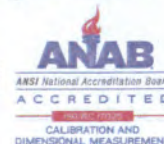
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Heat B_044_3

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R04	Verification Date	: 21 February 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEN040005	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.5	0.0	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24100363-5

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEH060047

ID. Number : B05

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 21 Oct 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 21 Oct 2024

Location of Calibration : In-Lab

Recommend Due Date : 21 Oct 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 22 Oct 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24100363-5

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd



ID LINE : IEC17025



Result of Calibration

Certificate Number : SPR24100363-5

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.1	0.086	0.20
35.0	35.012	35.1	0.088	0.20
40.0	40.017	40.1	0.083	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.1	0.086	0.20
35.0	35.012	35.1	0.088	0.20
40.0	40.017	40.1	0.083	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Humidity Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.2	0.186	0.20
35.0	35.012	35.2	0.188	0.20
40.0	40.017	40.2	0.183	0.20

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR25030358-1

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEG040059

ID. Number : B07

Environmental Conditions

Ambient Temperature : $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Relative Humidity : $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 19 Mar 2025

Calibration Date : 22 Mar 2025

Recommend Due Date : 22 Mar 2026

Date of Issue : 23 Mar 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology



Calibration Report

Certificate Number : SPR25030358-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR25010173-14	30 Jan 2026
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

NA - NA Caltechnologies Co., Ltd.



Result of Calibration

Certificate Number : SPR25030358-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.015	29.9	-0.115	0.20
35.0	35.012	34.9	-0.112	0.20
40.0	40.016	39.9	-0.116	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.015	29.8	-0.215	0.20
35.0	35.012	34.8	-0.212	0.20
40.0	40.016	39.8	-0.216	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.015	29.9	-0.115	0.20
35.0	35.012	34.9	-0.112	0.20
40.0	40.016	39.9	-0.116	0.20

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24100363-3

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak,
Bangkok 10900

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEL080034

ID. Number : B11

Environmental Conditions

Ambient Temperature : $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Received Date : 21 Oct 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 21 Oct 2024

Location of Calibration : In-Lab

Recommend Due Date : 21 Oct 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 22 Oct 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24100363-3

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd



ID LINE : IEC17025



Result of Calibration

Certificate Number : SPR24100363-3

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.021	30.3	0.279	0.20
35.0	35.018	35.3	0.282	0.20
40.0	40.019	40.3	0.281	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.021	30.2	0.179	0.20
35.0	35.018	35.2	0.182	0.20
40.0	40.019	40.2	0.181	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.021	30.2	0.179	0.20
35.0	35.018	35.2	0.182	0.20
40.0	40.019	40.2	0.181	0.20

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2$, providing a level of confidence approximately 95%.

- End of Certificate -



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Heat B_230_1

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B05	Verification Date	: 06 June 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEH060047	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.3	-0.2	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221. E-mail : sale@spscon.com., www.spscon.com

Heat B_230_2

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B07	Verification Date	: 06 June 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEG040059	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.4	0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.1	0.2	± 0.5
UUC* = UNIT UNDER CALIBRATION			



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Heat B_230_3

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B11	Verification Date	: 06 June 2025
Brand	: 3M	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEL080034	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.0	0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.3	0.0	± 0.5
UUC* = UNIT UNDER CALIBRATION			